



An Exelon/British Energy Company

Clinton Power Station

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U.S. Nuclear Regulatory Commission
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Clinton Power Station
Facility Operating License No. NPF-62
NRC Docket No. 50-461

Subject: Licensee Event Report No. 2002-003-00

Enclosed is Licensee Event Report (LER) No. 2002-003-00: Manufacturing Process Deficiency in Main Power Transformer Sudden Pressure Relay Causes False Actuation of Relay Resulting in Generator and Turbine Trip and Reactor Scram. This report is being submitted in accordance with the requirements of 10CFR50.73.

Respectfully

M. J. Pacilio
Vice President
Clinton Power Station

RSF/blf

Enclosures

cc: Regional Administrator - NRC Region III
NRC Senior Resident Inspector - Clinton Power Station
Office of Nuclear Facility Safety - Illinois Department of Nuclear Safety

IE22

LICENSEE EVENT REPORT (LER)

(See reverse for required number of
digits/characters for each block)

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1. FACILITY NAME
Clinton Power Station2. DOCKET NUMBER
050004613. PAGE
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4. TITLE

Manufacturing Process Deficiency in Main Power Transformer Sudden Pressure Relay Causes False Actuation of Relay Resulting in Generator and Turbine Trip and Reactor Scram

5. EVENT DATE			6. LER NUMBER			7. REPORT DATE			8. OTHER FACILITIES INVOLVED	
MO	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REV NO	MO	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
07	04	2002	2002	003	00	08	28	02	None	05000
9. OPERATING MODE		1	11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR § (Check all that apply)							
10. POWER LEVEL		095	20.2201(b)		20.2203(a)(3)(ii)		50.73(a)(2)(ii)(B)		50.73(a)(2)(ix)(A)	
			20.2201(d)		20.2203(a)(4)		50.73(a)(2)(iii)		50.73(a)(2)(x)	
			20.2203(a)(1)		50.36(c)(1)(i)(A)		X 50.73(a)(2)(iv)(A)		73.71(a)(4)	
			20.2203(a)(2)(i)		50.36(c)(1)(ii)(A)		50.73(a)(2)(v)(A)		73.71(a)(5)	
			20.2203(a)(2)(ii)		50.36(c)(2)		50.73(a)(2)(v)(B)		OTHER	
			20.2203(a)(2)(iii)		50.46(a)(3)(ii)		50.73(a)(2)(v)(C)		Specify in Abstract below or in NRC Form 366A	
			20.2203(a)(2)(iv)		50.73(a)(2)(i)(A)		50.73(a)(2)(v)(D)			
			20.2203(a)(2)(v)		50.73(a)(2)(i)(B)		50.73(a)(2)(vii)			
			20.2203(a)(2)(vi)		50.73(a)(2)(i)(C)		50.73(a)(2)(viii)(A)			
			20.2203(a)(3)(i)		50.73(a)(2)(ii)(A)		50.73(a)(2)(viii)(B)			

12. LICENSEE CONTACT FOR THIS LER

NAME
Greg Halverson, Station EngineeringTELEPHONE NUMBER (Include Area Code)
(217) 937-3102

13. COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT

CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX
B	EL	RLY	Q011	YES					

14. SUPPLEMENTAL REPORT EXPECTED

YES (If yes, complete EXPECTED SUBMISSION DATE)

X

NO

15. EXPECTED SUBMISSION DATE

MONTH

DAY

YEAR

16. ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines)

On July 4 the sudden pressure alarm for the 'B' Main Power Transformer (MPT) actuated in the Main Control Room and at the same time the reactor automatically scrambled from 95 percent reactor power. The sudden pressure alarm was initiated by a malfunction of the sudden pressure relay (SPR). The SPR initiated a Generator trip and lockout. The Generator trip caused a Main Turbine trip and Turbine Control Valve fast closure, resulting in the reactor scram. The SPR trip also initiated the 'B' MPT deluge system, and the fire pumps automatically started as expected. Operators entered Emergency Operating Procedures due to an expected low reactor water level transient. The root cause for the reactor scram was a latent defect in the bimetal of the SPR control orifice that likely occurred during the manufacturing process and resulted in a false actuation of the SPR. Corrective action for this event includes replacing the deficient 'B' MPT relay, testing the MPT SPRs for proper operation, and implementing a design change to modify the SPR trip logic.

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Clinton Power Station	05000461	2002	003	00	2 OF 4

NARRATIVE (If more space is required, use additional copies of NRC Form 366A) (17)

PLANT CONDITIONS PRIOR TO THE EVENT:

Unit: 1; Event Date: 07/04/02; Event Time: 0133 Central Daylight Time
MODE: 1 (POWER OPERATION); Reactor Power: 095 percent

DESCRIPTION OF EVENT

On July 4, 2002, at about 0133 hours, the sudden pressure alarm [ALM] for the 'B' Main Power Transformer (MPT) [XFMR] [EL] actuated in the Main Control Room and at the same time the reactor automatically scrammed. The sudden pressure alarm was initiated by an apparent malfunction of the sudden pressure relay [RLY]. The sudden pressure relay initiated a Main Generator [GEN] trip and lockout. The generator trip caused a Main Turbine [TRB] [TA] trip and Turbine Control Valve fast closure, resulting in the reactor scram. The sudden pressure relay trip also initiated the 'B' MPT deluge system [KP], and the fire pumps [P] automatically started as expected.

Following the scram, reactor pressure vessel (RPV) water level dropped, as expected, below the Low Level 3 trip setpoint to minus 3 inches narrow range indication, so operators entered Emergency Operating Procedure (EOP) 1, "RPV Control." (Low Level 3 is 8.9 inches narrow range indication.) At 0138 hours, in response to the reactor scram and the lowering RPV water level, operators entered the reactor scram off-normal procedure.

At 0138 hours, operators transitioned to EOP 1A, "ATWS RPV Control" due to not having indication that all control rods fully inserted. The full core display did not have position indication for some control rods and the full-in LEDs were not lit on both divisions of the Rod Action Control System (RACS) [AA], however, reactor power was zero percent. At 0139 hours, Division 1 RACS indicated that all control rods were fully inserted, so operators exited EOP 1A and reentered EOP 1. At 0141 hours, the Division 2 RACS indicated that all control rods were fully inserted. Action Tracking Item 114453-25 was initiated to track a review of this position indication issue.

The Low Level 3 RPV water level trip caused Primary Containment isolation valves [ISV] in Group 2 (Residual Heat Removal (RHR) [BO]), Group 3 (RHR), and Group 20 (miscellaneous systems) to receive signals to shut as expected; these valves were already shut prior to the event in accordance with the normal plant lineup. By 0327 hours, operators completed the Automatic Isolation Checklist and verified that the Primary Containment isolation valves responded as expected.

At 0240 hours, operators exited EOP 1 and continued reactor control in accordance with the reactor scram off-normal procedure. At 0955 hours, operators exited the reactor scram off-normal procedure and RPV water level and pressure were being controlled in accordance with the unit shutdown procedure.

The plant was maintained in Mode 3 (HOT SHUTDOWN) with reactor coolant pressure being maintained within a pressure band of 550 to 650 pounds per square inch gage (psig) and reactor coolant level was being maintained between the Low Level 3 and the High Level 8 setpoints.

No Main Steam [SB] Isolation Valves [ISV] closed or Safety Relief Valves [RV] lifted during this event.

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NARRATIVE (If more space is required, use additional copies of NRC Form 366A) (17)

During the reactor scram and 'B' MPT trip, the Plant Process Computer [CPU] System Common Core Unit [IO] locked-up resulting in the loss of some Balance of Plant computer points for Main Control Room indication. As a result of the computer system lock-up, operators were required to use alternate indication to compensate for the unavailable indications. The system was restored by 0658 hours by manually initializing it in accordance with the system operating procedure; the system operated normally thereafter. Condition Report 114455 was initiated to address the cause and corrective action for the lock-up of the computer system.

A prompt investigation team performed an immediate fact-finding to identify the suspected apparent cause of the event. The prompt investigation team concluded that the suspected apparent cause was hardware related and identified no human performance deficiencies.

The initial investigation of this event identified that the sudden pressure relay actuated without a true fault overpressure condition in the transformer. The relay is designed with a dead range (no trips) of 1.25 to 1.50 psig and a trip range of 3.00 to 3.25 psig. When tested after the reactor scram, the relay was found to trip 6 out of 8 times at the 1.50-psig level indicating that the relay was overly sensitive. Based on these "as-found" testing results, the relay was quarantined and sent to the original equipment manufacturer (Qualitrol) for failure analysis.

The sudden pressure relays installed in the 4 MPTs (including one spare MPT) were factory installed new relays for the new MPTs supplied by VA Tech - Elin. The new MPTs were recently installed (May 2002) during refueling outage 8 (C1R08) as part of extended power uprate.

The investigation confirmed that no other faults or disturbances existed on the 345-kilovolt transmission lines prior to the trip of the transformer. An inspection of the 'B' MPT identified no physical damage to the MPT.

Condition Report 114453 was initiated to track the investigation and resolution of this event.

No other automatic or manually initiated safety system responses were necessary to place the plant in a safe and stable condition. Other inoperable equipment or components did not directly affect this event.

CAUSE OF EVENT

The cause of this event is attributed to a false actuation of the sudden pressure relay. The root cause for the false actuation was a latent defect in the bimetal of the relay control orifice that likely occurred during the manufacturing process. This defect resulted in the bimetal orifice becoming more sensitive when exposed to higher operating temperatures.

SAFETY ANALYSIS

This event is reportable under the provisions of 10CFR50.73(a)(2)(iv)(A) due to the automatic reactor scram.

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NARRATIVE (If more space is required, use additional copies of NRC Form 366A) (17)

The plant responded normally to the reactor scram. The response and behavior of the plant during this event were compared to the Generator Load Rejection transient discussed in Chapter 15 of the Updated Safety Analysis Report and the General Electric Transient Safety Analysis Report and were determined to be within those analyses. This event posed no challenges to fission product barriers. All systems responded as required for an event without bypass valve failure.

No safety system functional failures occurred during this event.

CORRECTIVE ACTION

The faulty sudden pressure relay in the 'B' MPT was replaced with the relay from the spare MPT ('D' MPT). The sudden pressure relays for the 'A' and 'C' MPTs and the replacement 'B' MPT relay were tested and verified to operate properly.

A design change will be implemented to remove the station's vulnerability to a single failure of the Sudden Pressure Relay that results in plant shutdown. The design change will modify the sudden pressure relay protection scheme from a one-out-of-one trip logic to a fault tolerant trip logic in all 4 MPTs.

PREVIOUS OCCURRENCES

LER Number Title

LER 89-028 Water Intrusion Into Main Power Transformer Sudden Pressure Sensor Relay Causes Corrosion and Results in Relay Failure, Turbine Generator Trip and a Reactor Scram

Clinton Power Station experienced a previous sudden pressure relay false actuation resulting in a reactor scram in June 1989 when the 'C' MPT Qualitrol sudden pressure relay malfunctioned; however, that malfunction was caused by internal corrosion resulting from water intrusion into the relay. Deterioration of the sudden pressure relay from the water intrusion caused the relay to operate erratically.

COMPONENT FAILURE DATA

Manufacturer	Nomenclature	Manufacturer Model Number	Serial Number
Qualitrol Corporation	Rapid pressure rise relay	900-021-61	58179